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THE REGIONAL ECONOMIC CONSEQUENCES OF TARIFFS AND DOMESTIC TRANSPORTATION COSTS

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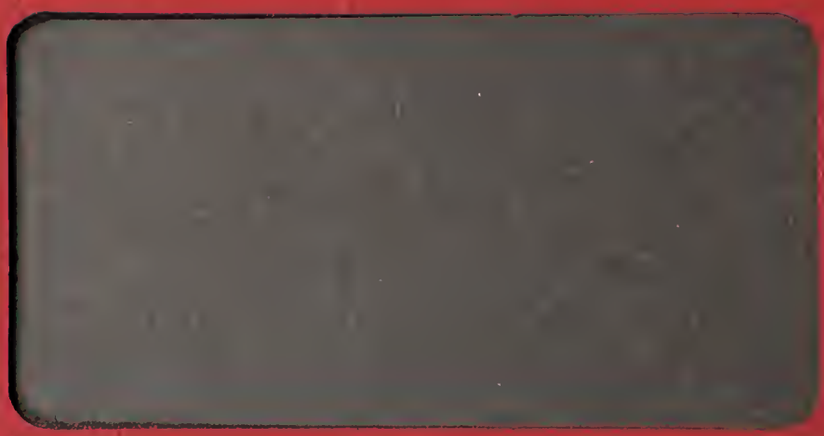

THE REGIONAL ECONOMIC CONSEQUENCES OF TARIFFS AND DOMESTIC TRANSPORTATION COSTS

by

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I. Introduction

When one reads the literature in regional economics one is struck by the almost complete neglect of the effect that international trade could have on regional welfare. There is also little consideration of the differential consequences that trade policy such as tariffs could have among regions. The traditional theory of international trade, on the other hand, in order to focus attention on trade among nations, has almost entirely abstracted from trade which may take place within a country and on the interactions between these two kinds of exchange. Indeed, the traditional models treat countries as points in space which present well-defined excess supply and demand vectors to the rest of the world. Transportation costs have never played an important role in theoretical trade models, and what little discussion there is concentrates on the costs of transporting commodities between countries. There is virtually no discussion of the role which interregional transportation costs could play in determining the country's trade patterns or the effectiveness of trade policies such as tariffs.

There may, of course, be situations in which the traditional trade assumptions are quite appropriate. For small homogeneous countries which typically trade with distant partners this approach may be quite acceptable. On the other hand there clearly are countries which are made up of geographically separated regions and where the transportation costs between these regions may well be larger than the transportation costs with neighboring

countries. Canada provides an obvious example where it is often true that East-West transportation costs are higher than are transportation costs to the closer markets in the United States. And for the United States in many situations transportation to Canadian markets, or even to markets in Europe or Japan, could be less costly than transporting commodities from one coast to the other, or from the north to the south. In such cases the regional consequences of transportation costs and tariffs and their interactions may be quite important.

In this paper some of the implications for regional policy of the explicit introduction of domestic transportation costs and the interaction with tariffs are considered. A model first introduced by Bhagwati and Brecher is extended to a regional context and some of the traditional regional problems and policy prescriptions are investigated. In Section II the model is introduced and some of the basic implications for trade are developed. Tariffs and taxes are introduced in Section III and the implications are compared with the traditional trade results. Section IV examines the regional consequences of trade and tariff policy, and the principal conclusions are summarized in Section V.

II. The Basic Model

In two recent papers Bhagwati and Brecher (1980) and Brecher and Bhagwati (1981) have shown that several of the theorems of the traditional international trade model must be modified if one explicitly introduces foreign ownership of the factors of production. As they suggest their model could be extended to consider other dichotomizations within the domestic economy, and the present analysis considers the effect of the geographical

separation of economic groups. The spatial character of the present model introduces a range of interesting implications not present in the earlier formulations.

In its basic form the model is the standard one. There are two goods, X and Y, produced with capital, K, and labor, L, under conditions of constant returns to scale. Both factors are assumed to be in fixed supply for the economy. For simplicity, it is assumed that preferences within the domestic economy are identical among regions and can be represented by a set of community indifference curves.[1] The assumption that tastes are the same among regions is made to focus attention on the effects of different regional endowments of factors. The assumption that tastes can be represented by a set of community indifference curves is made to simplify the analysis, and as I have shown elsewhere could easily be relaxed. (See Melvin, 1983.) It is also assumed throughout that the country is small and faces a fixed world terms of trade. This assumption is not crucial but allows one to focus on domestic policy issues.

Our departure from the traditional model comes by assuming that the domestic economy consists of two regions, the East, E, and the West, W. It is further assumed that transportation costs between these two regions are greater than are transportation costs between either region and the rest of the world. For simplicity, we will assume that positive domestic transportation costs exist, and that international transportation costs are zero. Such an extreme case is not required, but does simplify the analysis. Our final assumption is that the rest of the world (ROW) is so large and integrated that commodity prices everywhere are equalized. Thus the two regions in our domestic economy face the same set of world prices. It will

be seen that relaxing this assumption presents no particular difficulty from a qualitative point of view.

To illustrate how the domestic economy can be "regionalized" it is convenient to use an extension of a technique developed by Lancaster (1957). Figure 1 represents the factor box diagram for the entire economy, and with commodity X assumed to be labor intensive we have the production contract curve $O_X A O_Y$. With the economy assumed to face fixed relative prices, P, equilibrium would be at a point such as A. If from O_X we draw a line with slope equal to the capital-labor ratio in industry Y, and from O_Y a line with slope equal to the capital-labor ratio in industry X, we construct a parallelogram $O_X A O_Y B$. The allocation of the economy's total supply of factors between the two regions can be represented by some point within this factor box. Thus point N could represent the endowment of region E measured from O_X and the endowment of W measured from O_Y. If point N lies within the parallelogram, then both regions can produce both commodities with the same relative factor prices that would have existed had all factors been available at a single location. A contract curve for region E could be drawn through $O_X A_E N$, and a similar contract curve constructed for region W. Note that equilibrium factor price ratios at A_E, A, and A_W must all be the same, and equilibrium commodity prices for both regions and the economy as a whole would be identical.

In Figure 2 the production possibilities curve for the entire economy is represented as TAT' with the transformation curves for the two regions similarly labelled. With price ratio P, production points are A, A_E, and A_W, and correspond to the similar points in Figure 1. Note that A_E and

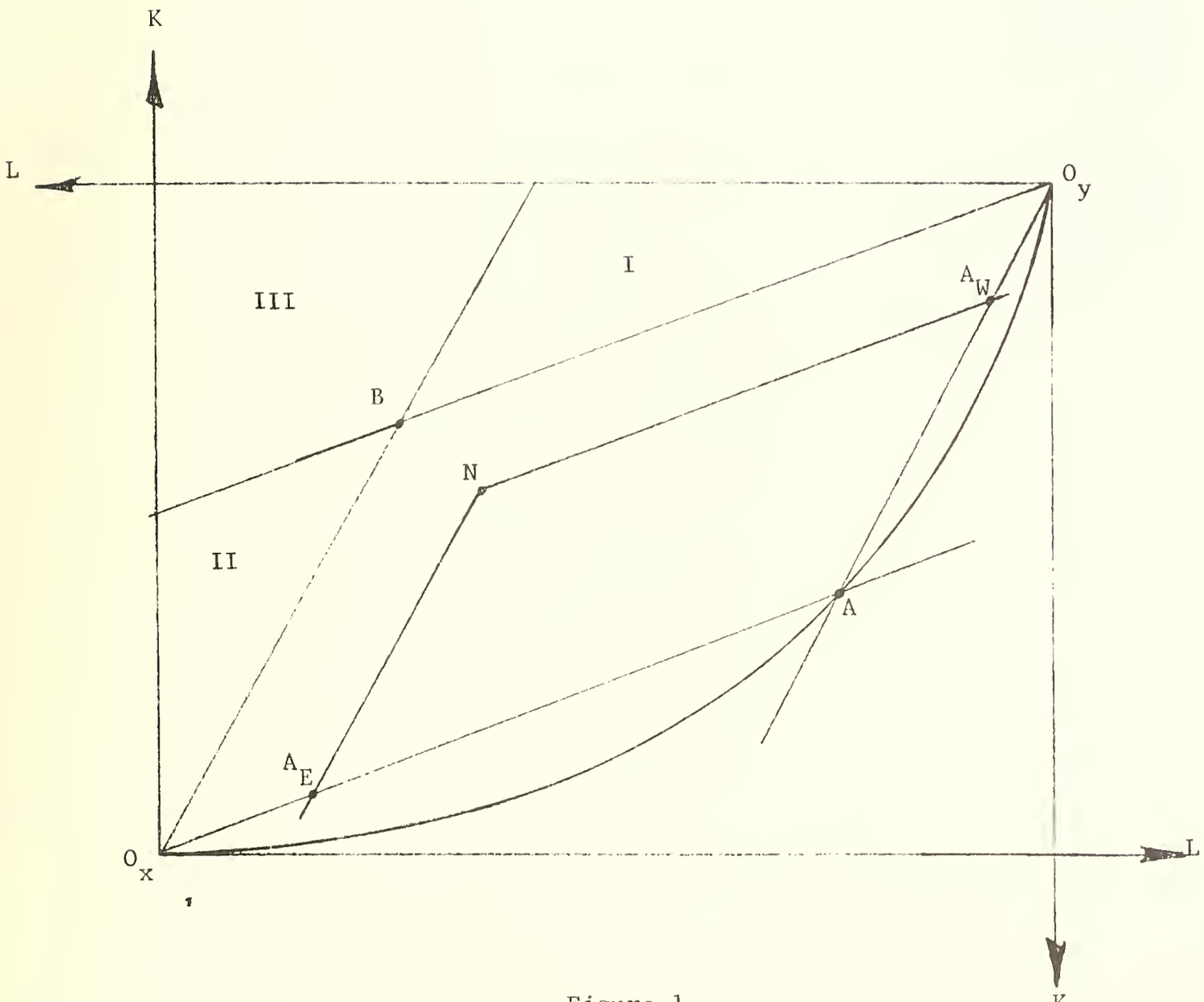

Figure 1

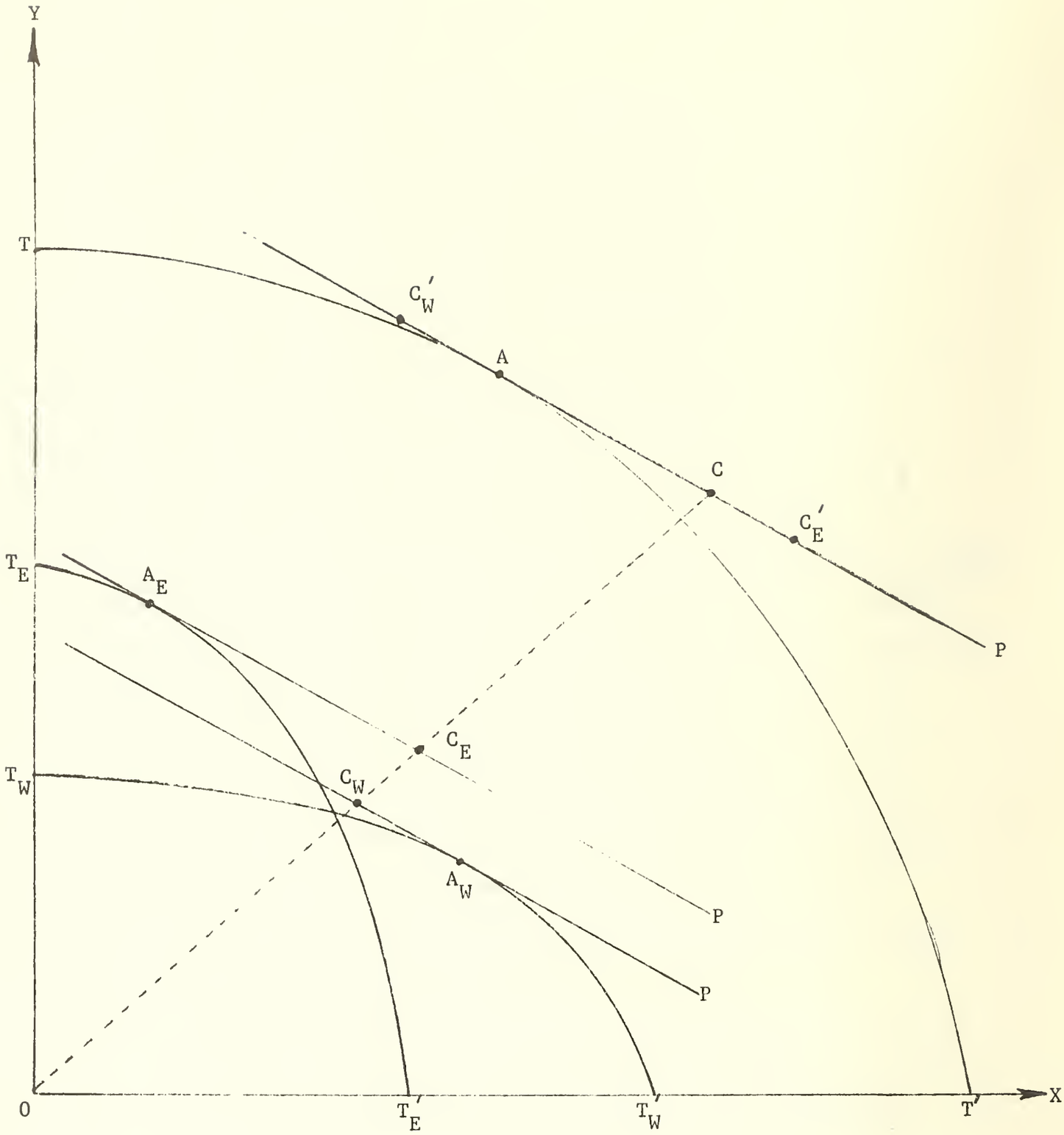

Figure 2

A_W sum to A, and that this will be true for the production points corresponding to any commodity price line as long as both goods are produced in both regions.

There is, of course, no reason to expect endowment point N to lie inside the parallelogram BO_XAO_Y. If it lies outside the parallelogram then either or both of the two regions must specialize in one or the other of the two commodities. Specifically, in area I region W will specialize in commodity X, in area II region E will specialize in commodity Y, and in area III E specializes in Y and W in X. Note, also, that the question of whether both goods can be produced in equilibrium in both regions, or whether one or both regions will specialize, will depend on commodity prices. For example, with endowment point N specialization by region E or region W can be generated by making commodity prices more or less steep. The situations where specialization occurs in one or both regions are simply special cases of the more general case where both regions produce both goods, and thus throughout the analysis we will consider only the case where the endowment point lies within the factor intensity parallelogram.

Several interesting conclusions can be drawn from Figure 2. Suppose that preferences are such that the consumption points for regions W and E are C_W and C_E, respectively. With such preferences the traditional trade model which does not take account of the possibility of regional production would have C as the economy-wide consumption point and the vector AC as the trade vector, implying imports of X and exports of Y. With regional production, while the consumption point would still be the same since C_W

and C_E must sum to C, the trade pattern will be quite different. Recalling the assumption that transportation costs are higher interregionally than internationally we note that the trade vectors for regions E and W are $A_E C_E$ and $A_W C_W$, respectively. In terms of the aggregate economy, this gives a trade vector $C'_W\ C'_E$, where $AC'_W = A_W C_W$ and $AC'_E = A_E C_E$. Thus, with the demand assumptions implied by this diagram, region W exports X and imports Y, while the trade pattern for region E is just the reverse. The economy as a whole, therefore, is observed to be importing and exporting both commodities and we have an explanation for what has been called cross-hauling, a phenomenon which has sometimes been thought to be in conflict with the standard neoclassical trade model. The analysis here makes it clear that in any situation where interregional transportation costs are higher than international transportation costs, and where regional trade patterns differ, the cross-hauling of identical commodities would be the expected result.[2]

Figure 2 also illustrates the fact that changes in the terms of trade can have quite different welfare consequences for the two regions. A relative increase in the price of Y, a change which would normally be considered as an improvement in the overall economy's terms of trade, will improve the welfare of consumers in region E but will make consumers in W worse off. Individuals in their role as factor owners, however, are affected identically regardless of their location. From the Stolper-Samuelson result the real return to labor will fall in both regions, the real return to capital will rise, and as long as both regions continue to produce both goods, real factor rewards will be identical everywhere in the economy.

Note, also, that while an increase in the price of Y will cause welfare to fall in region W, all consumers in the economy can still be made better off following such a change in the terms of trade. An appropriate interregional transfer from E to W can compensate the losers and make all individuals in the economy better off. Interregional transfers in Federal states could be justified on the basis of such changes in the terms of trade. We will have more to say on this point in Section IV.

Finally, note that the results just derived depend crucially on the fact that in the initial equilibrium the two regions trade in opposite directions. In Figure 2 if tastes were sufficiently biased towards commodity X so that the consumption ray lay to the right of A_W, then both regions would export Y, there would be no cross-hauling, and the welfare changes in both regions would be in the same direction for any change in the terms of trade. Region E would benefit more than W from such changes, of course.[4]

III. The Effects of Tariffs

The analysis of tariffs for the situation of Figure 2 differs in several respects from that of the traditional trade model. First of all, since in equilibrium both goods are being imported, a tariff can be applied to either or both commodities. As will be seen the effects of a tariff are symmetrical between regions, so to simplify the analysis we will first consider the case where a tariff is imposed on the imports of X. Such a tariff will have no effect on region W since that region exports X. In region E the effects are the traditional ones associated with the imposition of a tariff for a small country. In Figure 3, production will

move to A_t where price line P_t is tangent to the production possibility curve, and the new consumption point will be C_t where the price line P_t is tangent to an indifference curve along the world terms of trade P. Here and throughout the paper it is assumed that tariffs (and taxes) are returned in lump sum fashion to consumers in the region from which they were collected. Including interregional transfers of tariff revenue would be arbitrary and diagrammatically difficult.

Several interesting conclusions can now be drawn. First, because the tariff has had no effect on region W and has shifted the production point for region E from A_E to A_t the economy as a whole is now producing inside its production possibility curve. The new production point can be found by drawing from A the vector $A_E A_t$ giving A*, the vector sum of OA_t and OA_W. A* clearly lies inside the economy's production possibility curve. Thus, associated with the tariff we have a production inefficiency, or a deadweight production loss, quite distinct from the production change associated with moving along the production possibility curve that is usually associated with a tariff.

Now suppose the tariff is also imposed on commodity Y. This will have no effect on region E, but will have the usual tariff effect on region W, moving production along the production possibility curve towards the Y-axis. This will result in a further production inefficiency and the final economy-wide production point will lie further inside the production possibility curve TAT'. This situation has not been shown in Figure 3 for it is exactly symmetrical to the case of a tariff imposed in region W.

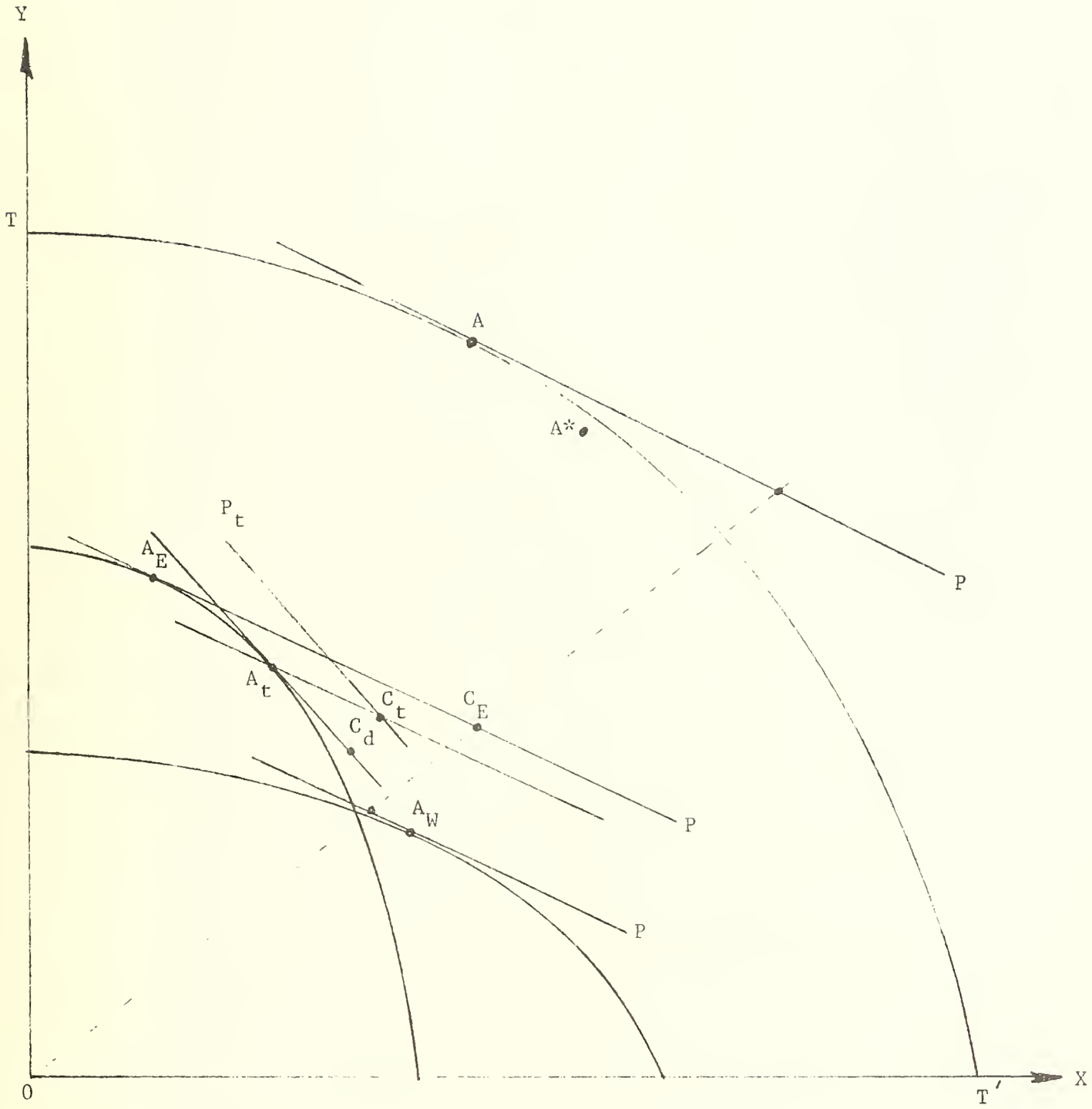

Figure 3

We now return to the case of a tariff only on X and recall our assumption that there are transportation costs between regions, but not between the regions and ROW. As we continue to impose higher and higher tariffs on commodity X it is quite possible that at some point the tariff rate will become equal to the transportation rate for commodity X between regions. Suppose in Figure 3 this has occurred at price line P_t. Now any small additional tariff will result in region E wishing to purchase commodity X from region W rather than from the ROW. Region W will be indifferent as to whether trade is with region E or with ROW as long as region E pays the entire cost of transportation. Let us further suppose that the exports of region W are sufficient to satisfy the demands for imports of commodity X by region E. Region E now imports from W and exports to ROW, while region W imports from ROW and exports both to E and to ROW. This means that region E is now trading along the price line P_t and consumes at point C_d. Because the tariff has overcome the transportation cost between regions, the gains from trade associated with being able to trade along price line P have been lost, resulting in a further welfare loss associated with the movement from C_t to C_d.[5] Thus, tariffs which result in the internalization of domestic trade produce a welfare loss which has not previously been recognized. The point is that as long as a tariff does not prohibit trade with ROW gains are associated with being able to trade at the favorable world terms of trade. Once such trade is eliminated, in this case by switching to interregional trade, this gain from trade is lost.

[5] The welfare loss associated with the movement from C_t to C_d in Figure 3 is equal to the tariff revenue which was collected before trade was diverted

from ROW to region W. In making the switch to trading with region W, region E is required to use up an amount of resources equal in value to his tariff revenue in order to transport commodities from one region to the other. Pursuing a tariff policy which results in such inefficient (and unnecessary) transportation is thus equivalent, from a welfare point of view, to throwing the tariff revenue in the ocean. In countries such as Canada it seems clear that the tariff structure has been designed principally to encourage domestic trade at the expense of international trade. It seems equally clear that the high costs associated with this policy have not been recognized.

Returning to the situation where a tariff is imposed on both commodities it can be seen that the results for region W are analogous to those just described for region E. Both regions will initially lose since consumption will move to points such as C_t. When the tariff is high enough to overcome the transportation costs both regions will switch from trading with ROW to trading with each other, and thus both will lose at least part of the gains associated with trading internationally. Of course, there is no reason to expect that trade between the regions will just satisfy all domestic excess demands and one would expect that at least one region will be left trading with ROW.

There are, then, two costs associated with tariffs in this model which have not been recognized in the traditional analysis. First, there is the deadweight production loss associated with the movement to the production point inside the economy's production possibility curve. Second, if the tariff results in the internalization of trade, gains from trading with ROW are lost.

It is possible, however, that even in the face of the costs described above a region may gain from the imposition of a tariff. To simplify the analysis it will be assumed that in the initial situation region W is self-sufficient so that only region E trades internationally. This case is shown in Figure 4 where C_W and C_E are the free-trade consumption points for regions W and E, respectively. Now suppose a tariff is imposed on commodity X which is higher than the interregional transportation cost. Region E will now want to import X from region W but this can only be done by bidding up the price of X in W, since otherwise no X is available for export. Suppose at price P_W region W is just able to provide the quantity of X demanded by region E. Note that the difference between the slopes of P_t and P_W represent the transportation costs between the two regions. Equilibrium consumption points for regions E and W would be C_a and C_b, respectively.

The consequences of a tariff in region E in this case are similar to those described in Figure 3. Initially the tariff moves the consumption point from C_E to C_t and then the internalization of trade moves consumption from C_t to C_a. For region W, however, the situation is quite different. The tariff-generated demand for region W's output has resulted in an improvement in the regional terms of trade and a consequent increase in welfare with consumption moving from C_W to C_b. Thus the tariff, while making the economy as a whole and the consumers in E worse off, actually increases the welfare of consumers in region W. It is now clear that this same result could occur even if region W was initially an importer of X. In this case a small tariff would initially eliminate trade and increases in the tariff would eventually result in trade in the "wrong direction". The tariff has therefore resulted in a reversal in the trade patterns for region W

and we have a case where a tariff can, in fact, generate trade. This trade, while welfare increasing for region W is clearly welfare reducing for the economy as a whole. It can also be shown that the same result is possible for the situation in Figure 3. A tariff may eliminate trade in one region before all trade ceases, and if a high enough tariff is imposed on the imports of the other region, trade patterns may be reversed.

The case illustrated in Figure 4 where, in the final equilibrium, excess demands and supplies of the two regions are just exactly equal is not, of course, to be expected. In general one region or the other would be required to trade with ROW in order to reach an equilibrium. This added complication will not change any of the results, but it would further confuse an already difficult diagram.

From this example we have seen that even for a small open economy a tariff could benefit a region, even if that tariff was initially imposed on that region's import commodity. This somewhat paradoxical conclusion results from the fact that the tariff first eliminates that region's trade with ROW, but then creates trade with the other region behind the tariff barrier.

One of the standard propositions of trade theory is that a tariff structure can be duplicated by a system of domestic taxes and/or subsidies. In the context of the regional model described here where the economy imports and exports both commodities it is easily shown that this equivalence no longer holds. First consider the situation where there is an equal rate tariff on both goods. In Figure 3 such a tariff structure increases the

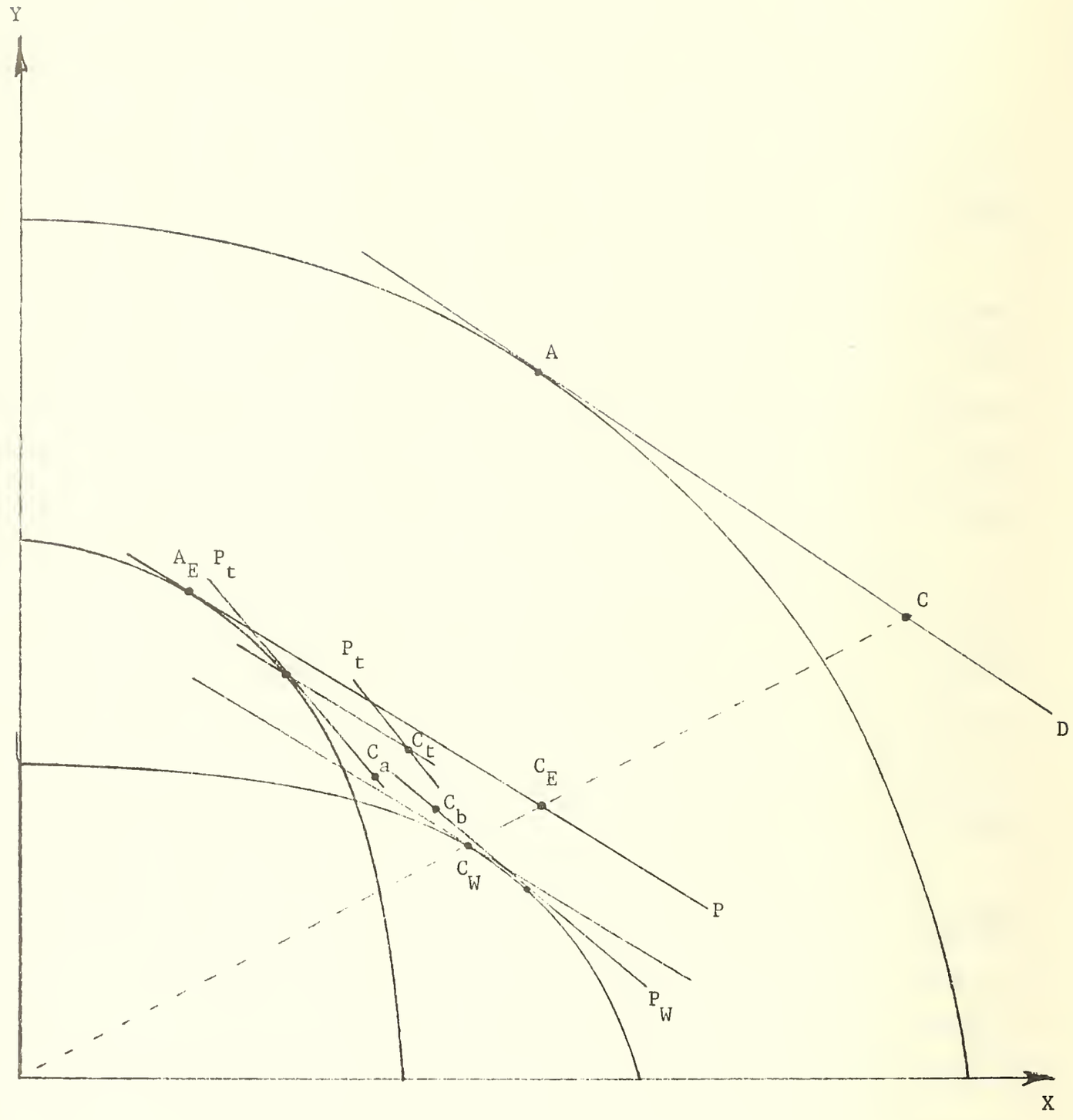

Figure 4

output and reduces the consumption of X in region E and increases the consumption and output of Y in region W. There is certainly no uniform tax-subsidy policy which could be applied to the entire economy which would accomplish this result. Of course, if taxes are allowed to differ among regions then the tariff effects could be duplicated. This possibility will be discussed in Section IV.

In Figure 5 the effects of a production tax on Y and a consumption tax on X which apply to both regions is illustrated. This tax system is equivalent to a tariff on X in region E, and thus for E Figures 3 and 5 are identical. For region W, however, the tax acts as an export subsidy moving production in W to A_s and consumption to C_s. While for region E the tax structure has the same welfare effects as a tariff, for region W for the case shown a tariff would have been preferred. The worst that a tariff can do is eliminate trade and move the region to the autarky position. In Figure 5 the tax structure has resulted in consumption inside the production possibility curve, and thus autarky would be preferred.

Domestic taxes have been seen to have different welfare consequences than a tariff, at least for one of the regions. The implications for the volume of trade are also quite different. A tariff will always reduce the volume of trade for the economy as a whole.[7] A tax which applies uniformly to both regions will reduce trade for one region and increase it for the other, and there can be no presumption as to how the overall volume of trade will change. Furthermore, note that in the tax equilibrium of Figure 5 the economy has become a net exporter of commodity X, ($C_sA_s \geq A_tC_t$), and thus the

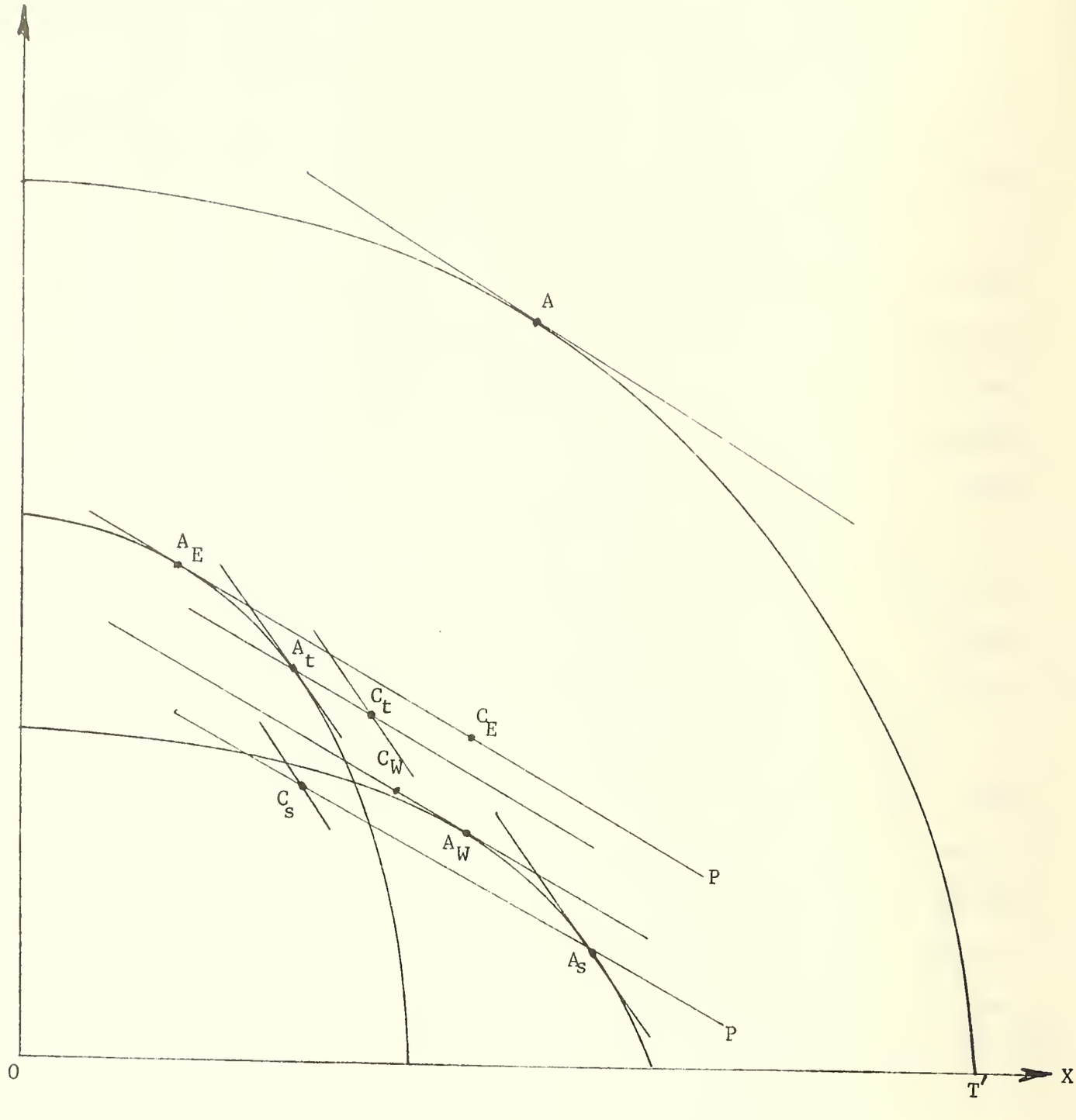

Figure 5

tax has resulted in a reversal of the pattern of trade. Those economists still interested in explanations of the Leontief Paradox can thus add commodity taxes in a regional economy to their list.

IV. Regional Economic Policy

As well as the implications for the traditional trade results discussed above, the explicit recognition of the regional characteristics of an open economy suggest some interesting domestic policy conclusions. Countries which are characterized by distinct regional differences often have a federal form of government, where lower levels of government (state or provincial) can be seen as representing, at least to some extent, these regions. Obvious examples are Australia, Canada and the United States. The existence of distinct regions and a federal system of government provide at least two additional policy dimensions than exist in a unitary state. First, the federal government may attempt to equalize the effects of external changes (or its own policy) across regions. Second, regional governments have some power to introduce their own policies, and these may either reinforce or act in opposition to federal policy. Several examples of such policies and implications for an open economy can be provided.

In Section II it was shown that improvements in the economy's terms of trade would increase welfare in E and reduce welfare in W. Interregional transfers for the purpose of equalizing regional welfare or income levels could be suggested on the basis of such changes in the terms of trade. But note that since real factor rewards remain the same in the two regions (because commodity prices are the same) such transfers would result in higher real incomes to both capital and labor in W, the disadvantaged region. This, of course,

assumes that all residents of region W share in the transfer. Thus for transfers which do not completely offset the welfare changes associated with a terms-of-trade change we have the somewhat paradoxical result that the combination of a terms-of-trade change and a transfer to the disadvantaged region could leave the utility of all residents in W lower but the real income of all residents higher than for residents of E. This seeming paradox is easily resolved by noting that the regional welfare difference is just a consequence of the fact that E has relatively more capital owners whose incomes have risen relative to the incomes of labor. This raises the issue, however, of whether economic policy should be concerned with regions or with individuals. The observed reduction in the welfare or income of W which gave rise to the transfer is a consequence of the relative income reduction suffered by labor in both regions. If this is seen as inappropriate it would seem more equitable to subsidize labor in both regions rather than all consumers in W. Note that the real losers of such a terms-of-trade change combined with a transfer to W are the owners of labor services in E. These individuals lose first because their real incomes fall and second because they will presumably pay, through taxation, for the transfer to W.

We have also seen that tariffs, through their effects on real factor rewards, can affect factor incomes across regions. In Figure 3, for example, a tariff in one or both regions will, from the Stolper-Samuelson theorem, result in differences in real factor rewards between regions. The increase in the relative price of X in region E will increase the real rewards to labor and reduce the real rewards to capital. If a tariff is also applied to Y, real factor returns to factors in region W will change in the opposite direction, so whatever the tariff structure, after a tariff has been imposed we will observe that

$$(W/P_X)_E > (W/P_X)_W \text{ , and } (W/P_Y)_E > (W/P_Y)_W \text{ .}$$

A similar pair of inequalities can be written for capital. While one would not suggest that tariffs are the only reason why one might observe differences in regional factor rewards they may well be a contributing factor.

Now suppose factor mobility between regions is allowed and for simplicity assume that only labor migrates. With real wages higher in E labor will leave region W and move to region E, and a question of interest is whether this factor mobility would be expected to remove the regional factor price differences. The answer is clearly no. As long as commodity prices remain fixed in the two regions, factor mobility will have no effect on relative factor rewards. From the Rybczynski theorem we know that the movement of labor from W to E will increase the output of X in E and reduce it in W, and will reduce the output of Y in E and increase it in W. This will have the effect of bringing the capital-labor ratios closer together in the two regions, but will not change the capital-labor ratios for the industries, and will not change relative factor prices. Thus with unchanged commodity prices real factor rewards are unchanged.

In the literature in regional economics one finds puzzlement as to why the significant amount of factor mobility which has occurred among regions has not reduced regional income differences. In his widely referenced paper Borts, referring to the United States for the periods 1919-1929 and 1948-1952, states that "The failure of wages to converge is rather surprising in view of the available evidence that these periods witnessed considerable interstate migration from low- to high-wage states." (1960, p. 163.) In the Canadian context the Economic Council of Canada concludes a section on Canadian

regional disparities with the observation that "In sum, regional disparities in income and job opportunities are indeed substantial and remarkably persistent in spite of the amount of labor migration that has taken place over the years." (1977, p. 60.) We now see that such factor mobility should not be expected to reduce these differentials, and indeed mobility cannot affect factor prices as long as relative commodity prices are unchanged. Other more direct policies such as interregional transfers or equalization payments should also not be expected to change real factor rewards unless they also change relative commodity prices. They will, of course, change factor incomes as was noted earlier.

It has been shown that factor movements will not change factor returns as long as commodity prices remain fixed. Sufficient factor mobility, however, could result in changes in the commodity prices in either or both regions. Figure 6 shows the situation for region E with A_t and C_a the pre-factor movement equilibrium of Figure 4. An inflow of labor from region W will cause E to move along the Rybczynski line $A_t A_r$ and at A_r all trade will have been eliminated. Factor prices will still be unequal across regions, however, and thus the labor inflow will continue. Now, since trade had been eliminated, this increase in labor will result in a gradual increase in the relative price of Y as prices adjust to equate regional demands and supplies. The final equilibrium could be a point such as C_f. Note that it is assumed that the tariff and the transportation costs continue to eliminate the possibility of trade either with region W or with ROW.

The opposite changes are occurring in region W where the labor outflow is causing the production possibility curve to shift inward as the economy moves along its Rybczynski line. Again, after trade has been eliminated, the price of X will begin to fall and factor flows will cease only after commodity prices have been equalized between the

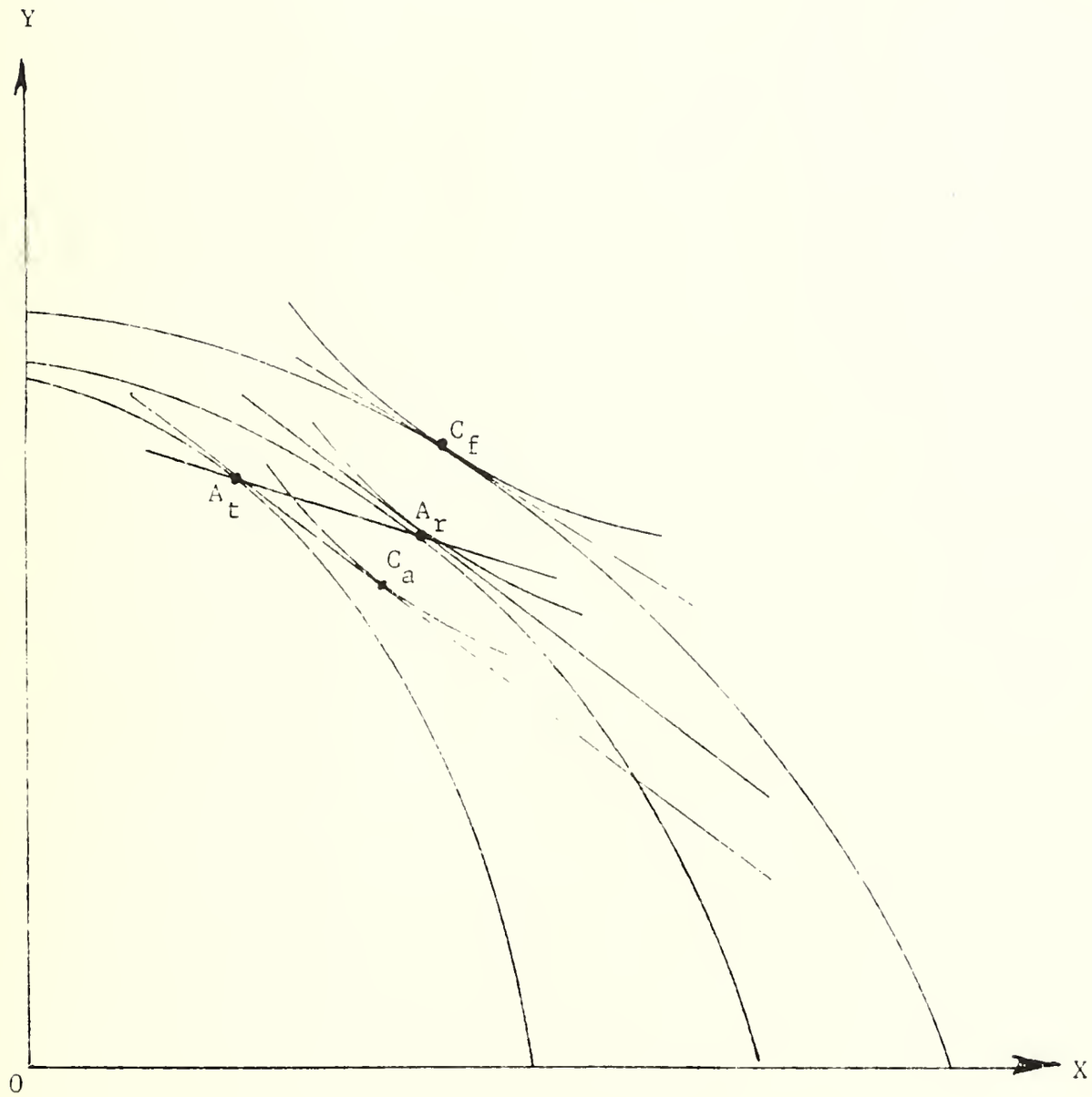

Figure 6

two regions. At this point, of course, both regions have exactly the same capital-labor ratios and they thus differ only in terms of size. Both will now be scaled-down versions of the overall economy. In the final equilibrium, all the distortionary effects of both the tariff and the transportation costs have been removed by factor flows, so that eventually factor mobility will eliminate differences in regional real incomes. This new equilibrium is equivalent to the autarky situation for the economy as a whole. The gains from trade associated with consuming at points such as C in Figure 4 have been lost in the process, although were the tariff to be removed the free-trade equilibrium could be re-established.

We have seen that in this model unrestricted factor movements will eventually equalize capital-labor ratios across regions and will thus equalize relative factor rewards. As has already been noted, such equalization has not been observed in practise. Several explanations can be suggested. First, the mechanism suggested here requires that commodity prices be equalized across regions, for only then will factor prices be equalized. Commodity price equalization requires that factors flow in response to any small factor price differential until capital-labor ratios in the two regions are equalized. There are a wide variety of reasons why factors may not be as mobile as required. For one, while it has been implicitly assumed that factor movements are costless, this is certainly not the case in practise, particularly for labor. Although the costs associated with relocation are typically of the once-and-for-all variety, they can be quite significant, and one would not expect labor mobility to proceed beyond the point where the discounted value of the stream of extra earnings expected in the high wage region were equal to the costs of relocation.

For capital, relocation costs in the long run may well be small but in the short run could be extremely high. Even in the long run capital may be immobile if it is industry specific and/or if industries are closely associated with resources which are differentially endowed among regions. There are, then, a number of explanations for why interregional factor movements have not proceeded to the point where capital-labor ratios are equal across regions. If such equalization does not take place regional differences in factor rewards will persist.

We now turn to consideration of the possibility that the policies of the two levels of government may be in conflict. Such a possibility does not arise in the traditional international trade model where a unitary government is implicitly assumed. Returning to Figure 4 suppose the federal government has imposed a tariff on commodity X, resulting in a reduction in welfare for region E and an increase in welfare for W. The welfare loss for E comes from two sources; the traditional loss associated with a tariff for a small country, and the additional loss associated with the internalization of trade. To offset these losses two types of policies could be pursued; policies to increase transportation costs and policies to counteract the tariff. For the former, while direct interference with interstate or inter-provincial trade is usually excluded by law, indirect measures are available. High licencing fees for trucks or other transportation modes can be imposed. Transportation costs can be increased by charging high taxes for gasoline or by imposing (or allowing) high terminal costs at transhipment points. And given the importance of truck transport, the provision and maintanance of highways can have an important influence on the real costs of transportation.

A simple and effective policy to counteract the tariff itself would be an appropriate commodity tax or subsidy system, assuming that the secondary level of government has authority to levy such taxes. In Figure 4, a production tax on X and a consumption tax on Y, both equal to the original tariff on X, would move production and consumption back to A_E and C_E respectively. Note that such a policy would also eliminate the loss associated with interregional trade; the movement from C_t to C_a. Furthermore, since interregional trade has been eliminated, the possibility of region W gaining from the tariff policy has also been eliminated. Finally, note that while taxes here have been proposed as an offset to federal tariff policy, taxes could also be used to duplicate the effects of a tariff. It was shown in Section III that taxes levied at the federal level would have quite different effects than tariffs since such taxes would apply to all regions. If taxes can be applied at the regional level, however, they can duplicate tariffs imposed by the federal government.

V. Conclusions

The traditional international trade assumption that countries are points with no spatial characteristics has been a useful simplification and has resulted in a rich body of trade theory. There are circumstances, however, where the implicit assumption that all production within a country takes place in a single location obscures some interesting regional policy questions. As a result there has been almost no discussion of the interaction between trade policy and regional policy in the presence of transportation costs. The purpose of this paper has been to analyze some of these interactions.

Beginning with a model of an economy consisting of two regions having different factor endowments and with significant transportation costs between them it was first shown that one might expect the economy as a whole to be both importing and exporting the two commodities; the phenomenon of cross-hauling. It was also shown that changes in the terms of trade could have different welfare effects on the two regions.

The introduction of tariffs and taxes also produced results which differed from those of the traditional model. A tariff was shown to result in production inefficiency, and could produce inefficient interregional transportation which would also reduce welfare. The economy may switch from collecting tariff revenue to using up resources in the production of unnecessary transportation. Indeed Canadian tariff policy seems to have been designed to do precisely this. Tariffs could also result in welfare gains to a region if they result in a reversal of the trade pattern and a switch in trading partners from ROW to the other region. Thus even in a small open economy a region may be better off with a tariff. Taxes were shown to have different consequences for welfare and the volume of trade than in the traditional model, and at the federal level the traditional equivalence between tariffs and a tax system cannot be established.

The implications of the model for regional policy were examined, and it was found that interregional transfers to correct income or welfare differences could result in lower real incomes for all factor owners of the "better off" region, raising the question of whether regional incomes or factor incomes should be the appropriate policy target. It was also shown that tariffs could generate differences in factor rewards, and that factor mobility would not

equalize these rewards unless there is enough mobility to equalize relative factor endowments across regions. Several reasons why this was not to be expected were suggested. Thus in an economy with distinct regions subjected to a tariff system, differences in regional factor rewards should be expected to persist, and attempts by governments to equalize regional incomes will almost certainly be unsuccessful.

FOOTNOTES

[1]In particular it is assumed that all individuals have identical and homothetic preferences. For a careful discussion of the conditions under which community indifference curves exist see Chipman (1965).

[2]For an example where domestic taste differences could give rise to cross-hauling see Melvin (1983).

[3]Similar differential effects for terms-of-trade changes for nationals and foreigners were discussed by Brecher and Bhagwati (1981).

[4]This is the volume-of-trade effect identified by Brecher and Bhagwati (1981).

[5]This loss is entirely borne by E because of our assumption on the distribution of tariff revenues.

[6]While a tax (or an export subsidy) is potentially worse than any tariff it is not always worse. It is certainly possible to construct cases where a tariff reduces welfare more than would an equal rate export subsidy.

[7]Note that this will be true whether there is a tariff on only one or on both commodities.

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